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AN OUTLINE OF THE HISTORY OF METEOROLOGY IN POLAND
(FROM THE TENTH TO THE FIFTEENTH CENTURY)

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PART II

This is the continuation of an article by Mr. Parzenewski, which was published in the first number of "The Review" of April 1948. In part one the introduction was given and the earliest period from the tenth to the fifteenth century presented. A discussion was begun of the research work in the hundred years that followed. The present number contains a discussion of both the research work and the oldest meteorological stations in Poland. The Editor

Also at this time the first books devoted to the problem of meteorology began to appear. The first of these was written by Andrzej Mirowski, educated at the Academy of Krakow. Mirowski finished at the Academy of Krakow under the sponsorship of Mikolay Korocinski, the Starost of Predecki, for whose sons he was advisor and guardian. He went abroad with them, and while making the trip spent some time in Wurzburg. During his stay there, where many Poles were living at the time, his book, entitled THEORIA VENTORUM appeared in 1596. In it he discusses the causes and effects of the wind. So far as we know, Mirowski was the first Polish author on meteorology. The first real manual in meteorology, however, was written in 1643 by a Professor Poczapowski of the University of Wilno, and another somewhat

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later by Adalbert Tytkowski, in 1669; Tytkowski in his manual, entitled "Metaeorologia Curiosa," patterned himself after Aristotle in his descriptions of meteorological phenomena. His book consists of four parts, the first two of which are devoted to meteorological phenomena in the strictest sense of the word; wind, clouds, fog, rain, snowfall, hail, thunder, lightning. It also includes certain observations on the climate of Poland.

In the meantime some events of unusual importance to meteorology occurred, namely, the invention of the air thermometer by Galileo (around 1597) and the barometer by Torricelli (in 1643). Meteorologists were thus given the chance to make records not only of a qualitative but of a quantitative nature.

At this time intellectual life was to a great extent transferred to Warsaw, because we know that in conjunction with her elevation to the dignified position of capital city 18 March 1595, learned men from the nation and from abroad began to gather there. It was in the period when the first thermometers and barometers appeared that Wladyslaw IV ascended the throne. He was an enlightened King, actively interested in learning, the best illustration of which is his correspondence with Galileo. This concerned Galileo's arrangement to send the king three pairs of glasses for "perspective." King Wladyslaw IV wrote the following in his own hand on 19 April 1636: "What is noble is most dear to us. They openly deserve the love of sovereigns who have the privilege of your grace's respectability, for you, by your extraordinary know-

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ledge have become eminent in the world and have a multitude of admirers, and your esteem has found with us a corresponding value..." And in answer Galileo wrote: "I shall send your most gracious and unconquerable Majesty three pairs of glasses..." The possession of such things was a rarity at that time.

He was also perhaps the only sovereign then who tried to interpose in Rome to save Galileo's unhappy fate when he was persecuted because of the scientific theories he published. Therefore it is not at all astonishing that four years after the invention of the barometer (in 1647), the Caputian, Walerian Legel performed an experiment with the barometer at the royal palace in Warsaw before the king and his whole family. Legel supported the experiment with an appropriate lecture in which he called attention to the phenomenon of the vacuum created in the barometer, and then as he himself expressed it: "Rumors arose about this great miracle of nature and there were many who doubted or simply forbade it when King Wladyslaw IV ordered theologians of all the monasteries to assemble on 18 July 1647 to examine the evidence."

The problem of improving thermometers developed parallel with that of measuring barometric pressure. Many learned men, beginning with Galileo's students, took up the problem and tried to improve the master's invention. The first mercury thermometer, however, was made in Gdansk about 1715 by Daniel Gabriel Fahrenheit (1686-1736). Fahrenheit was an able designer - his thermometers were noted for the fact that their readings agreed among themselves. The rather astonishing choice

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of the fixed points of his thermometer was made for two reasons: first, he doubted that water always boils and freezes at the same temperatures and therefore he took the temperature of a healthy human being as one of his fixed points; secondly, he thought that the lowest temperature (about minus 12 degrees Centigrade) of the particularly severe winter of 1702, which measured 32 degrees Fahrenheit below the melting point of ice, was absolute zero; consequently he took that as his zero point.

Fahrenheit was born in Gdansk and therefore was a citizen of the Republic of Poland. It was in Gdansk also that he designed his first mercury thermometer, and who knows, he might have lived there all his life if it had not been for the constant disturbance of the Swedish wars. But he considered himself a Pole until the end of his life, even though he left Gdansk and settled in Holland permanently.

Observations of pressure in Warsaw were made occasionally but soon ceased, and the capital had to wait a whole century before they were renewed. In the meantime many books dealing with the problems of meteorology appeared. One of them deserves attention: a book by the Reverend Gabriel Rzaczynski, published in Sandomierz in 1721. A translation of its full title reads: "An interesting natural history of Poland and Lithuania and the countries adjoining them, divided into 20 tracts, taken from writers of good repute, from manuscripts of various eyewitnesses, from traditions and experiments which are authoritative, worked out by Gabriel Rzaczynski, Father of the Society of Jesus, in Sandomierz, by letters of the

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College of Jesuits. Published 1721." This book, published in a provincial locality during a period of general decline in learning and culture, has, despite numerous drawbacks, many good qualities which give evidence of the great learnedness of the author. Rzaczynski's book consists of 20 treatises of which No XVI discusses unusual heat spells and droughts and describes mild and severe winters, and sections XVII and XVIII describe meteorological phenomena.

Several years later, the work of G. Brndtel, entitled "Warsawia Fizyka i Astronomia... etc" appeared. In it the author gives the results of his observations of barometric pressures, wind direction, and comments on weather conditions. This is the first collection published in Poland of conclusions methodically drawn from systematic observations. Brndtel did not limit himself to numerical computations, but made many comments on the atmosphere. For example, in section III he discusses the air: "We have become so accustomed to the air and take it so for granted that not one person in a hundred pays attention to its indispensableness to life. And as for its composition and importance, it is not until an accident happens so that a person is deprived of air for a moment, or has his mouth and nose blocked, that he realizes that he cannot do without air even for a minute without putting himself in apparent danger. Since the air is so apparently and indispensably necessary to our lives, all enlightened people ought to give well-deserved thanks to those who have tried to explore the nature of this element with exactness. As a result of recent discoveries and investigations by learned people, it is known that the air is a sort of covering composed

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of various gases, which surrounds the earth on all sides, that the air not only extends along the surface of the earth, but reaches to the highest regions of the ether, that the ether, entering all bodies and penetrating everywhere with its subtlety, lightness, and movement, softens the air and gives the life force to all living beings."

After this another man from Gdansk, Professor Danow, published in 1765 a four volume work entitled *Historia Naturalis*, in which he treated meteorological problems independently of Aristotle's views.

The above-mentioned books bring to an end the cycle of meteorological works published in Poland in the Latin language. The next books on meteorology were in Polish; for example, Experimental Physics, worked out in 1764 by Samuel Chroscikowski. In it the author discusses among other things: pressure, weight and compressibility of the air, and explains how the barometer and thermometer operate, etc.

Another person who wrote in Polish was the Reverend Josef Osinski, the author of many scientific works, who published a 25-page work in 1784 called *How to Protect Life and Property from Lightning*. (For his services in the field of science, Reverend Osinski (1738-1802), a professor of physics and mathematics at the celebrated Konarski Collegium, was awarded a gold medal *bene merentibus* by King Stanislaw August. He was also made one of the first members of the Warsaw Society of the Friends of the Sciences, *Towarzystwo Warszawskie Pozyjaciol Nauk.*). In it he discusses methods of installing light-

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ning rods, teaches how to protect oneself during electric storms and fights deep-seated prejudices. However, Reverend Osinski had also devoted a passage to lightning before that, for in 1777 he had published Physics Confirmed by Experiments, which was republished in four editions. Here he discusses the phenomenon of lightning and supports his hypotheses with descriptions of many experiments. Other authors wrote in this field too. In 1786 a book called The Electricity Noted in Earthly Bodies and in the Atmosphere, written by Franciszek Scheidt a professor at the Academy of Krakow, appeared in Krakow.

Piotr Swickowski (1755-1793) also showed keen literary interest in the above-mentioned themes. In his Historical and Political Memoirs of 1784, he wrote an article entitled "Lightning Rods and the Superstitions Impeding Their Increased Use." He published two articles in the Warsaw Magazine, the first of which in 1784 describes "Lightning and Lightning Rods," and the second of which (1785) gives "Hints for Protection from Lightning Both Indoors and Out."

The convincing arguments of the above-mentioned writers, especially Osinski's, were not without effect. In July of 1784 the first lightning rod in Poland was installed at the Royal Palace (Zamek Krolewski). In August of that same year the bishop, the Reverend Michal Poniatowski, ordered the clergy to discourage the idea of averting lightning by ringing church bells, and at the same time to recommend Osinski's book which speaks: "of the tested, safe, and inexpensive way of protecting personal property from lightning."

As a result of the above-mentioned works, prejudice

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was gradually overcome and the installation of lightning rods was begun. Thanks to this, lightning began to be directed to the ground in a path controlled by man.

People, even though half-enlightened, were making their first attempts to subdue the atmosphere, so that evidently they were not unaware at least of the phenomena manifested in it.

The influence exercised at that time by the Commission for National Education is reflected by the rise in the general level of learning and in the increase in number of those interested in the natural sciences, and therefore by their heightened interest in meteorology. Proof of the wide interest which meteorology enjoyed at that time in school studies can be found in the fact that the list of problems to be discussed "under the supervision" of Franciszek Schmidt during "The Annual Census of the Pupils in Physics, Natural History and the Arts" of the Schools of the Faculty of Lubel taken in 1782, contained about 20 parts devoted to meteorological problems. (Originally a teacher at the Schools of the Faculty of Lubel; then Professor of Physics in Krakow; and from 1787 to 1803 Professor at the University of Jagiello. In 1803 he and Jan Sniadecki were removed from their Professorships by Austriakow for their patriotic ideas.) Several of these are taken word for word from the original which was in the library of the Krasinski estate until the Warsaw Insurrection.

"41. What the nature of a barometer is and why the mercury in it doesn't fall.

45. The air nearer the earth is denser, the air farther away is more rarified.

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46. Warm air becomes rarified and cold air becomes dense, for which reason the mercury in barometers is higher in the winter and lower in the summer.

62. Winds are only agitated air; this agitation can be caused by the slightest thing which upsets the equilibrium of the air. The following destroy the equilibrium: (1) heat, (2) cold, (3) vapors and exhalations (exhalations resulting from warm air, authors note), (4) hail storms, (5) frequent firing of guns.

68. Vapors consist of minute particles of water and other moist or watery substances.

69. Fogs, clouds, rains have their origin in watery vapors carried by the air to various altitudes.

70. Sulphurous and bloody rains have natural causes and for that reason strike fear into the uneducated.

87. Lightning is nothing but electrified air. We have two proofs to show that lightning has its origin from electric matter, for (1) we can draw electricity from the air, (2) all the features which lightning manifest can be demonstrated by our electricity.

88. The method given us by Franklin of preserving towns, villages and buildings from lightning by means of rods is infallible for various experiments have confirmed it.

89. When there is lightning it is most essential to maintain presence of mind. Thunder travels 1038 feet per

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second or per one pulse beat, but electricity more than 125,000 feet per second; therefore if you hear thunder immediately after the flash of lightning, you can be certain that the storm is nearby..."

THE WARSAW METEOROLOGICAL OBSERVATORY (EIGHTEENTH TO NINETEENTH CENTURY)

As we mentioned previously, almost immediately after the invention of the thermometer and barometer -- the two basic pieces of apparatus for meteorology -- attempts to make systematic measurement with them began. Warsaw participated in these attempts from the middle of the seventeenth century -- from the first moment after the invention of the barometer -- and because of this became one of the best meteorological observatories throughout the world. But longer series of observations was begun in Warsaw by G. Erndtel, doctor of philosophy and medicine, court doctor to the Polish king and Saxon prince elect. Erndtel made observations for four years -- from 1725 to 1728 inclusive -- and published his data in a work entitled "Warsavia physice illustrata." Some sources say that Erndtel had partial help in collecting his data from G. Bautenberg, a surveyor sworn in by the Republic of Poland. Others say that Bautenberg made his observations independently of Erndtel. If the latter was the case, it would mean that in the eighteenth century Warsaw had two separate meteorological stations, whose results could have been compared when the manuscripts of the above-mentioned observations were eventually discovered.

When Erndtel halted his observations, there followed a

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A 34-year break in the observations made in Warsaw with the aid of the instruments. In the meanwhile a Warsaw merchant, Dawidson, a man of Swedish origin, made observations without instruments for 8 years. Every day from the year 1755 to 1763 he scrupulously took down all changes taking place in the atmosphere and also recorded the most important occurrences. In 1761, observations with instruments were resumed by the learned Frenchman, Guettard, a member of the Paris Academy, who took advantage of his stay in Warsaw by conducting observations for two years. His aide during this period was the Reverend Delaue, the Secretary of the French Embassy under the Polish King. Together these two conducted instrument observations in 1766. Guettard published the mean results of his observations in 1762 in "Memoirs of the Academy of Paris," and six years later included them, literally a pile of them, in the first volume of his works ("Memires sur differentes parties des sciences et arts" by Guettard, Paris, 1768). He writes: "Today more than ever before we know what use observations such as these have; people demand today that they be given the full detail. The mean results obtained for every month for everything that occurs in the atmosphere are not always sufficient for the various tasks which physicists set themselves in the work they undertake. These incentives influenced me to publish the observations which I made daily for a period of two years."

From 1779, that is, after a break of 16 years, observations with instruments were begun anew, and have gone on without interruption till the present day. That continuous cycle was begun by the Reverend Jowina Bonozza Bystrzycki, the court

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astronomer to King Stanislaw August, who three times a day went out onto the terrace of the royal palace to record the pressure and temperature: at sunrise, then between 1400 and 1500 hours, and in the evening between 2100 and 2200 hours. (The results of his observations of the temperature caused provisions to be made as to the method of setting the thermometer up and half-covering the mercury container with a wooden case.)

Reverend Bystrzycki made observations for 20 years (from 1779 to 1803). Further work on meteorological observations in Warsaw was done by Karol Kortum, a member of the Warsaw Society of the Friends of the Sciences. Unfortunately Kortum limited his observations to noting the barometric conditions and the water level of the Wisla three times during a period of 24 hours.

In the meantime there fortunately appeared a person who undertook to carry on his shoulders for a quarter of a century the burden of making daily meteorological observations within an extensive scope. This person was Antoni Jagier (1762-1837). He made regular objective meteorological observations from 1803 to 1828. (It seems that Jagier must have occasionally made observations much earlier because in 1802 he had become so oriented in them that he could work out and publish instructions: "The use of the barometer, thermometer, and other meteorological instruments.").

Jagier was a professor of physics and mechanics at the Warsaw Lyceum (which was established in 1804). This school was the predecessor to the University of Warsaw, whose opening the Prussian government in power at that time did not wish to permit.

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Evidence of the scientific level of the liceum is shown by the fact that when the university was opened, nine lecturers from the liceum became professors at the university.

Magier outfitted an observatory at his own expense on the third floor and roof of his house, which was located in Stary Miesc at 95 Linna Street. He made meteorological observations three times a day at 600, 1200 and 2200 hours. They consisted of barometer readings, thermometer readings, pluviometer readings, the wind direction by a lo de see scale, and a description of sky conditions. Then Magier carefully clipped from the newspapers all news about characteristic meteorological phenomena and pasted them in his journal of observations. (For example, we find a notation about lightning striking and killing 48 to 50 head of grazing oxen in July of 1821, in the village of Brzostowice near Flonka.)

Magier collected his observations in three volumes, the first of which includes the observations made by his predecessor, Reverend Gysztaycki. Magier carefully put Gysztaycki's observations into publishable form and then beautifully elaborated on them. The other two volumes consist exclusively of his own personal observations. All three volumes were purchased from his heirs for the library of the Warsaw Observatory and remained there till 1870 when they were loaned to the Main Physics Observatory in Petersburg where they may in all probability still be found. It ought to be emphasized that Magier gave liberally of his own money for the dissemination of data concerning the branch of learning dear to his heart. After

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organizing the works of his predecessor, he published at his own expense a "Meteorological Lap," worked out by Jastrzebowski, and two articles of his own with instructions for making meteorological observations. Few inhabitants of Warsaw know that Magier left their city a monument in the form of a sundial which to this day may be found on the main walk of the Saxony Garden near an inactive fountain. Today one can still read its half-obliterated inscription: Erectum ex laqueo Antonii Magier A. D. MDCCCXIII.

At the January 1820 meeting of the Warsaw Society of the Friends of the Sciences, it was announced with regret that Antoni Magier, that tireless observer of the weather, had been ~~forced~~ ^{forced} to conclude his work because of a broken leg. At this meeting attention was called to the fact that during his 45 years of disinterested labor, this investigator made 27,393 thermometer and barometer readings, and as many observations of wind direction and sky conditions. Also he made 25,213 observations of the humidity of the air, about 3,120 measurements, begun in Warsaw or distances the mercury fell, and 555 observations of evaporation (with the aid of apparatus that he himself designed), amounting to a total of 138,00 observations.

The Society of the Friends of the Sciences, despite its praises for Magier's services, could not give him the appropriate acknowledgement due him as a member of the Society to which his changes in fortune gives evidence.

Magier was made an "adopted" member in 1805, and then became a regular member. In 1820 he was removed from the list

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of regular members, but was restored in 1827. On the occasion of the discussion concerning Magier's becoming a regular member 29 November 1827, Professor Kitajewski of the Main School proposed to strike a gold medal in Magier's honor. Unfortunately his proposal was not approved. It was re-examined in November of 1829 at a meeting to discuss the interruption to Magier's pioneer work but again was not approved. This was because of the objections of Lelewel, an extreme stickler for details of formality. It was probably also guided by the disinclination to such reward on the part of that modest worker in the field of meteorology. And so Magier did not live to receive any just rewards for his labor of many years, although during the discussion it was clearly emphasized (by Professor Kitajewski) that: "his many years' perseverance in making meteorological observations and his uncommon dedication of the greater and best part of his life would alone merit the greatest praise... even if the results of this work were to lack the excellence desired. But what are we to think when the Society itself has spoken so many times of the real usefulness of this work, especially if you keep in mind that an appropriate reward certainly encourages many to enter the field of meteorology, a knowledge of which to date is still only slightly propagated and perfected, and is so important for agriculture."

The Warsaw Society of the Friends of the Sciences did not pay the debt of acknowledgement due to Magier. He was quickly forgotten, as is wont to happen when an individual ceases to be useful as a result of some infirmity. What

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happened to Nagler after he ceased making observations is not known. We know only that he took part in the November insurrection, but probably did not carry a weapon.

After Nagler stopped his observations, Skrodski, a professor of physics at the University of Warsaw, continued them. The results of his observations were posted daily at the town hall in Warsaw.

Nagler was still carrying on his observations when there arose in Warsaw a body which undertook the labor - further systematic meteorological observations - so profitable to science. This institution was the Astronomical Observatory, in which, shortly after its opening 20 November 1825, an uninterrupted succession of observations was begun. They were made four times within a 24-hour period with the aid of accurate instruments. They included the following measurements: pressure (the barograph was put into use toward the end of 1821), temperature, maximum and minimum temperature and humidity (determined by August's psychrometer), wind, barometric laws, the over-all weather conditions.

These observations were begun by Jan Baranowski (1825-1835); they were continued by Adam Przemowski (1836-1850) and then taken up by Berkiewicz (from 1851) and others.

The observations made in the Warsaw Astronomical Observatory were published every month in the Warsaw Magazine. Then the means of these observations, together with a detailed description of the course of the weather in the past year, were put on Warsaw Calendars and, later, on calendars published by the Astronomical Observatory. Thanks to a great extent to

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the investments made by the Astronomical Observatory. Warsaw can be proud of the long-continued observations of temperature, and the exceptionally valuable series of observations of pressure obtained from December 1825 by an accurate barometer placed for the whole time at the same height above sea level. The same is true of the measurements of the barometric lows, the observations of which were begun in Poland by Antoni Langer in 1803. (Systematic measurements of lows were begun in Europe by the English in 1662). In fact till 1913 he, exclusively, took note of the fall of rain so that for that period when there is a lack of data for winter periods we have found, nevertheless, (thanks to the fact that the personnel of the Observatory further carried on this work, almost a 100-year series of observations presenting a uniformity of data important not only to our knowledge of the climate of Warsaw but also to the physicists of the whole world. Note that many observations of barometric lows exist in the world - particularly any that are accurate and have been conducted over a long period of time. Beginning in 1886 Warsaw has had two similarly operated meteorological stations. One is in the Astronomical Observatory, and the other in the Bureau of Meteorology established at the Museum of Industry and Agriculture.

RESTRICTED OBSERVATIONS IN LOCALITIES OTHER
THAN WARSAW (EIGHTEENTH TO NINETEENTH CENTURY)

Poland belongs to the first ranks of those states which first undertook the labor of compiling data of meteorological observations made with instruments. It will be sufficient if

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we recall that Warsaw, Wrocław, ^{Gdansk}~~Warsaw~~, and Terun comprise the oldest observatories in not only Europe, but also the whole world, although other Polish cities are by no means in last place. In support of the above-mentioned we cite this list of the first ten European stations founded before 1750.

1. Florence - - the first references concern observations conducted almost immediately after the invention of the barometer, that is, after 1643. Subsequent observations were made between 1644 and 1670, after which there was a period of inactivity for many years.

2. Warsaw - - the first observations were begun in July 1647; subsequent ones were continued between 1649 and 1674, between 1725 and 1728, and between 1761 and 1762. Beginning in 1770 the observations have continued without interruption.

3. Paris - - Observations began in 1649. The reliable series of observations dates from 1757.

4. Stockholm - - the earliest observations date from 1649. The reliable ones began in 1758.

5. Wrocław - - the earliest observations date from 1692. A comparative series was begun in 1731.

6. Berlin - - observations begun in 1717. Comparative data dates from 1850.

7. Gdansk - - first series of observations took place from 1739 to 1769. Comparative data dates from 1870.

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8. Upsala -- First series of observations extends from 1739 to 1759, after which there is an inactive period of many years.

9. Torun -- beginning observations date from 1740; subsequent series from 1751 to 1759, and 1760 to 1767.

10. Piotrkow -- beginning observations date from in 1763.

Any localities participated in the work of increasing the number of Polish observatories. Those which are distinguished for the long duration and high quality of their observations are Warsaw, Wroclaw, Gdansk, Torun, Krakow, Wilno, and Lwow.

We will devote a few words to a survey of their achievements. Since we have already discussed Warsaw let us start with Wroclaw.

The first reference to meteorological observations in Wroclaw date from 1692. Regular observations capable of comparison were not begun in Wroclaw until February of 1771. They were continued without interruption till the present day. Regular meteorological observations were begun in Wroclaw, as they were in the majority of other large cities, at the Astronomical Observatory, where meteorological equipment was set up in the so-called "mathematical tower." The observations in Wroclaw were not worked out by single individual but by consecutive directors of the Observatory. Among those who worked on them in the middle of the nineteenth century was the observatory director at that time -- a man named Boguslawski.

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The station ranking next with regard to years of observation is Gdansk. The oldest series of observations with the aid of instruments took place in Gdansk from 1739 to 1769. Comparative observations were not begun until 1807 however. They have continued to this day, yet, records of weather observations made without instruments were maintained by individuals in Gdansk much earlier. We know of P. Butner's chronicle kept from 1655 to 1699, meaning that it was kept by one man over a period of 44 years. From Gdansk too comes one of the oldest references in the world to the occurrence of the phenomenon called a "halo." Let us not forget either that Fahrenheit was born and began his scientific work in Gdansk.

Nor can we overlook Torun in this survey. In 1740 occasional observations of heavy frosts were made here. The next data, relating to temperature, are from 1751 to 1759. They were obtained by means of the Florentine thermometer, and the Reaumur. Other references to heavy frosts lead us to believe that observations of air temperatures began to be made in Torun by at least 1751, if not 1740. From 1760 to 1767 there was steady series of observations twice a day of the pressure, temperature, height of the fall, wind direction, and the characteristics of over-all weather conditions.

Let us turn now to the achievements of Krakow where studies in astronomy were already numerous toward the end of the fifteenth century. What is more important, from Krakow comes the oldest observations of the weather conditions in Poland without the aid of instruments. (Professor Biem

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and others). Observations with instruments were begun in Krakow on May 1792. From 1807 to 1810 there was a break in observation and then they were resumed; but observations were not taken at fixed times so they are not completely reliable. Beginning in 1826 definite hours for making observations were established, and the kinds of observations were organized in a way such as allowed comparison. In Krakow as elsewhere, the chief center conducting meteorological observations was the Astronomical Observatory. Krakow has the richest material in all Poland for research on the progress of barometric pressure. This is true because in 1848 systematic recording in this factor by means of the barograph was begun. Along with this, special treatises on the progress of atmospheric pressure appeared in Krakow: Zajackowski's Barometrical Conditions in Warsaw (1864), and Buszczyński's Pressure in Krakow (1891).

Wilno was the core of a series of observations begun between 1770 and 1772, that is, from the time the Astronomical Observatory was built. They were begun by the Reverend Marcin Buczubut, and continued by Jan Smiadecki, starting in 1807. In the course of the observations made at the Astronomical Observatory, there was a series of more or less long periods of inactivity caused by several factors: the Kosciuszko insurrection (1793), the burning of the Observatory, etc. Only from 1817 to 1849 is there a continuous, uninterrupted series of observations, but the times set for the observations were not fixed. The morning readings in the spring, summer, and fall were taken at a much earlier hour than in the winter. Only in 1849 were definite hours established for observations. Those made by the Wilno Astrono-

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ical Observatory were discontinued in February of 1883 as a result of the liquidation of this institution.

In Lwow a series of meteorological observations was begun in 1851 by Doctor Reimer and continued by him till 1867, when observations began to be made at the University of Lwow (1868-1884) and the Technical School (1882-1885).

Meteorological observations were made in innumerable places other than the above-mentioned centers. In 1895 Poland had about 200 meteorological stations. Some of them lasted a short time, and were swept away because of unfavorable political conditions or the disturbances of war. This happened to the meteorological station organized by A. Chodkiewicz near Lubna (on the Volynia), where he carried on his observations between 1886 and 1890. They were suddenly interrupted when the observer's home was converted into a field hospital, "which was the reason why important meteorological observations were discontinued."

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